Public Engagement in Electricity Network Development: The Case of the Beauly–Denny Project in Scotland

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Abstract

Ambitious renewable energy targets and an aging infrastructure necessitate a substantial upgrading and expansion of the electricity networks around Europe and beyond. Although vital for the functioning of the economy and a green energy future, grid development projects are often met by public opposition, which increase costs and lead to lengthy planning processes. Therefore, understanding the social aspects of a green energy economy is becoming increasingly important. The current planning frameworks have proven ineffective at resolving conflicts among stakeholders, indicating the need for a new approach. We analyse these issues from an economic perspective, outlining the economic characteristics of transmission developments and public engagement. We identify previously overlooked features of the planning process that contribute to the rise in conflicts, public opposition and prolonged project realisation. The Scottish Beauly-Denny high voltage transmission development is discussed in detail and our findings indicate a need for better engagement with local communities at an earlier stage of planning. Trust between communities, developers and government is important for the negotiations and can be achieved through transparency, specific education and set guidelines for stakeholder engagement in the planning process.

Key words: Electricity transmission, public engagement, property rights, energy policy, electricity networks.

JEL classifications: L94, L98, D23, P48.

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1. Introduction

The future of energy networks holds important technical, economic, and social challenges. Across Europe, the electricity grids are in need of modernisation as they fail to support the ongoing development of energy production and transmission. Additionally, in order to connect the large number of emerging renewable energy generation plants an expansion of the networks must take place. This holds across both distribution and transmission networks although the development of distributed generation as well as demand for electric vehicles, among other things, is particularly exerting pressure on the distribution networks to take on a new role as active networks compared to a previously passive role (Book chapter reference here). Meanwhile, the larger developments of transmission networks tend to dominate the public debate, much due to their greater impact in terms of importance for the nation as a whole, cost, environment, as well as impact on neighbouring communities.

Network developers face a number of constraints which may extend the planning process or delay the project - negotiations with the regulator to justify the need case and cost efficiency, certain environmental constraints which will have to be considered, a change in government policy – are a few of the potential constraints. However, the focus of this paper is that of public opposition and, although not new, it is proving to be a major aspect in planning and development of recent developments.

Objections to major projects often relate to environmental, visual and health aspects (Soini *et al.*, 2011), particularly from communities in close proximity to a planned development. Failure to agree between stakeholders leads to costly delays or even causes projects to be abandoned altogether. As a result, the potential for reaching the targets set for reducing carbon emissions and climate change, thus a green energy future, is in jeopardy (European Commission, 2008).

Grid development projects tend to affect a number of stakeholders – from state and local communities to NGOs, landowners and corporations – each with different objectives and perceptions of the project and surrounding matters. The existing decision-making processes and institutions have proven ineffective at resettling conflicts that appear between different stakeholders, causing uncertainty and delays. Increased information provision and public engagement in transmission line planning is suggested to increase public trust in network companies, public acceptance and therefore accelerate the

realisation of new developments (RGI, 2012; Newig and Kvarda, 2012; Cotton and Devine-Wright, 2010). The Aarhus Convention (European Community signed and implemented in 1998 and 2003 respectively) advocates early and effective public participation to increase the transparency of the planning and decision-making process.

Public engagement implies the involvement of members of the public in policy-forming and policy development. The concept is not new but it is becoming increasingly important in infrastructural developments. For example, a recent UN legal tribunal found that the UK government had failed to provide sufficient information and decision-making powers to the public regarding two major wind developments (UN, 2014).

However, despite the pressure through the Aarhus Convention there are no established guidelines, rules or frameworks defining how public participation ought to be formalised. Recent high-profile projects, such as the Norwegian Hardanger line and the Scottish Beauly-Denny line[1], show that transmission projects increasingly involve vested social, economic and political interests. Noticeably, there is a need for new approaches for defining and organising the role and tasks of the actors, including the public and affected communities.

Exploring project characteristics and stakeholder relations using an economic approach is previously untested but can potentially generate several efficiency improvements. Based on the seminal works by Coase (1937) and Williamson (1979) on the role of institutions, this paper identifies and analyses economic characteristics of transmission projects following an Institutional Economics approach. Additionally, using the contentious Beauly-Denny High Voltage Transmission Line project and input from previous literature, this paper outlines how public engagement may be approached to allow for a more efficient planning process.

The paper is outlined as follows: Section 2 outlines the analytical framework and the economic characteristics of transmission developments and public engagement. Section 3 presents and discusses the case of the Beauly-Denny transmission line and Section 4 concludes.

[1] The Hardanger transmission line, due to cross the Hardanger fjord on the Norwegian west coast, was one of the most reported news stories in Norway in 2010. The Beauly-Denny transmission line received over 20,000 objections and was covered extensively by UK media.

2. Theoretical Framework

In disputes such as those occurring between grid developers and communities, assumptions of perfect information, costless transactions, and rationality are often unrealistic. Traditional neoclassical theories relies heavily on these assumptions and is therefore of limited usefulness when analysing practical issues (Wawer, 2007; Coase, 2000; Kumkar, 1998). Classic economic theories consider commodities, labour and consumers as the smallest units in the analysis of the relation between the individual and forces of nature. This allows economists to study how supply and demand determine prices but not the factors that determine what goods and services are traded on markets and therefore are priced. New Institutional Economics (NIE) considers the activity between actors and the norms governing them (i.e. transactions) as the smallest unit because these must be negotiated before any level of production, exchange and consumption can occur (Commons, 1931).

As such, NIE offers an alternative method of enquiry compared to more orthodox theories. NIE accepts assumptions of profit maximisation and efficiency but rejects those of zero transaction costs, rationality and perfect information. Institutions refer to the rules of an economy such as formal rules (e.g., written rules of contractual agreements, constitutions and laws) and informal constraints (e.g., unwritten codes of conduct, social norms of behaviour and beliefs). Organisations (i.e. a group of actors bound together by a common purpose to achieve common objectives) on the other hand are considered as the players in the economy. Actors form institutions to reduce transaction costs and uncertainty as they facilitate transactions and cooperative behaviour (North, 1990).

Williamson (1979) argues that transaction costs depend on asset specificity, uncertainty, opportunism, bounded rationality and frequency of transactions. Specificity is highlighted as the most important aspect and may appear in the form of site specificity, physical asset specificity or human asset specificity (Williamson, 1981).

Reaching unanimous decisions in transmission developments is difficult due to two main characteristics. First, the size of projects, including physical, financial, and number of stakeholders, makes negotiation difficult as the involved parties have different objectives and stakes in the project. Second, many decisions involve public goods which are difficult to quantify and therefore risks being exploited. These characteristics lead to uncertainty, undefined and therefore unsuccessful principal-agent relationships, as well

as information asymmetries. In turn, this generates increased transaction costs, externalities, and subsequent market failure.

In the following sections, we analyse the issues faced by transmission developments using the central concepts of NIE, namely transaction cost theory, property right theory, and agency theory.

2.1 Economic characteristics of transmission developments

The integration of high levels of renewable energy sources in electricity systems and having effective market competition in wholesale electricity generation both require substantial investments in new and upgraded transmission networks. At the same time, transmission grid is a natural monopoly function and is, as a result, subject to economic regulation and oversight by the sector regulator (Biggar and Hesamzadeh, 2014). In practice, this means that over-spending or disallowed investments on new grid projects will reduce the revenues and profits of the network utilities (Joskow, 2008). The technical nature of the transmission networks means that determining the operational and economic benefits of the grid projects can often be complex (see, e.g., Volk, 2013; Brattle Group, 2013).

Transmission lines are essentially electricity highways with the purpose to transport electricity, for example from an area rich in resources to one where demand outweighs supply. Areas at either end of a transmission line can enjoy benefits from new installations, including income from energy production, reduced electricity prices and a more reliable service. The benefits to the areas along the lines are less obvious. Connecting renewable energy sources and reliable networks benefit the country as a whole, yet potential costs of reduced property prices, visual amenity, tourism and damages to wildlife are mainly borne by communities along the line. These costs are not easily quantified as they can either be labelled as public goods or they are not directly observable. Thus, the construction of new transmission lines produce externalities as the local social costs are greater than the private costs.

The planning process of grid developments is highly specific and depends on the knowledge and experience of consumers, developers and authorities. Reaching unanimous decisions in transmission developments is difficult as the physical and financial size of projects, as well as the number of stakeholders, equally makes cooperation difficult as the involved parties have different objectives and stakes in the

project. Public knowledge regarding electricity networks relate largely to technical aspects, such as pylons and wires, rather than their organisations (Devine-Wright *et al.*, 2010). The low level of public knowledge regarding transmission line development and administration is not only a cause of increased public opposition to new grid projects, it also restricts increased public participation and a more active role for communities within the development process.

Another aspect is the large number of affected communities and citizens along the transmission line. Although all stakeholders should have the chance to express their attitudes towards a project, it would be impossible to consider all statements and objections. The Beauly-Denny project alone received over 20,000 objections. The developer and planning authority must balance the public's right to be taken into account and the acceleration of developments.

2.2 Economic characteristics of public engagement

Public engagement is defined as the practice of involving members of the public in policy-forming and decision-making activities of organisations responsible for policy development. Depending on the flow of information between the participating public and the responsible organisation, public engagement is divided into (i) public communication; (ii) public consultation; and (iii) public participation. Public communication relates to a one-way information flow from the organisation to the public whilst public consultation considers a flow of information from the public to the organisation. In public participation, a formal dialogue takes place and information is exchanged between members of the public and the organisation (Rowe and Frewer, 2005). Public engagement is therefore considered in policy and decision-making frameworks only if initiated by the responsible organisation. However, the extent to which public engagement is allowed to influence the process is often unclear.

Newig (2007) notes that the rationale for public participation includes access to local knowledge, attitudes and acceptance, increased awareness, transparency and, thus, trust between stakeholders. If properly framed, some of the lessons from public participation could be used to address opposition to and conflicts due to grid development projects. Combined, these could alleviate conflicts. Given the similarities between sustainable environmental planning and the characteristics of the energy sector, e.g. multiple stakeholders, public goods and market failure, instruments of environmental governance and policy analysis such as cost-effectiveness and social and environmental

cost-benefit analysis are also applicable to transmission developments (Think, 2013; LIFE Elia, 2015).

Public engagement in power line projects shares some features with that of other major infrastructure developments. Such engagements have often been discussed in the literature in the context of specific types of projects: for example, nuclear power plants (Otway *et al*., 1978), in the context of carbon capture and storage (Kraeusel and Möst, 2012), wind power (e.g., Swofford and Slattery, 2010) or airports (e.g., Jue *et al.,* 1984). Recent large-scale grid projects like the Beauly-Denny transmission line however show that the public takes an increasing role in the realisation and success of these projects.

3. The Beauly-Denny Transmission Project

3.1 Background

There are two main transmission network owners (TOs) in Scotland: Scottish Hydro Electric Transmission Ltd (SHETL), a subsidiary of Scottish and Southern Energy plc (SSE), and Scottish Power Transmission Ltd (SPT), a subsidiary of SP Energy Networks. Scotland's energy policy is devolved from the UK government, and therefore independently decides on consents for developments of energy infrastructures. However, the TOs in Scotland are regulated by the UK wide energy regulator Office of the Gas and Electricity Markets (Ofgem) and National Grid, the English TO, operates the system.

The Scottish and UK government targets of tackling climate change have prompted an increase of renewable energy generation. The existing transmission capacity is insufficient to allow the intended renewable energy facilities to connect to the network. As part of their transmission licences, SHETL and SPL maintain that they have a duty under the Electricity Act 1989 to develop and maintain an efficient, co-ordinated and economical system of electricity transmission. This is to facilitate competition in supply and generation of electricity. The Beauly-Denny line was argued to be a key infrastructural development towards maintaining competition and enable development of renewable energy.

3.2 Beauly-Denny project facts

The Beauly-Denny High Voltage Transmission Line (HTVL) is a high profile development, subject to the longest ever public inquiry in Scotland. It has been followed

closely in media and has generated close to 20,000 objections from all over the world (see Douglas, 2010). The planning process has taken ten years from the initial identification of the need for the project to the start of construction. Applying the theoretical framework outlined in Section 2, this case study will focus on how consumer engagement was managed in the Beauly-Denny planning process. The project is an example of how conflicting interests of the stakeholders delay the execution of projects and reveals a lack of suitable a decision-making framework for such developments. The study is based on first hand information collected through interviews with key stakeholders and an extensive research and collection of information published by all the relevant stakeholders.

In September 2005, SHETL and SPT applied for planning consent under Section 37 of the Electricity Act 1989 to construct a new high voltage power-line between Beauly, near Inverness, and Denny, near Stirling. The project involves the construction of a 220 kilometres[2] long 400kV double circuit overhead transmission line set to replace the current single circuit 132kV transmission line, which will be dismantled as part of the development. One circuit will operate at a voltage of 400kV and the other at 275kV. Further expansion and construction of substations will also take place. Approximately 600 steel pylons between 43 and 65m tall will support the line, although the majority of towers are between 50 and 56 meters tall. The spacing of towers are dependent on topography, altitude and the exposure of weather effects, such as high winds, but will normally vary in a range of 275 to 450m and they will be fixed in the ground using concrete tower foundations (SSE, 2012a; SSE, 2012b). The Beauly-Denny project was completed and the new line went live in November 2015.

The new power-line mainly follows the same route as the old 132kV line, however changes in the use of land in the course of time required slight deviations (Figure 3.1 illustrates the new route in relation to the old route). The 220km long stretch is divided into four sections, separated by the new substations. The landscape along the line is characterised by varying land uses including remote moorland, forests, river valleys, roads (A9) and some more populated areas[3]. The routing around the Stirling area was particularly contentious as the power-line passes close to residential areas and near Stirling's most famous tourist attractions: Stirling Castle and the Wallace monument. Following the longest public inquiry in Scotland, Scottish Ministers gave consent to the

[2] SHETL is responsible for 200km and SPT is responsible for 20km.

[3] See Appendix 1 for a more detailed outline.

construction in 2010, provided that certain mitigation measures were adapted. SPT voluntarily work closely with Stirling council to reach agreement on an appropriate mitigation scheme and the final consent was given in December 2011 and construction commenced in February 2012[4].

Strategic options

Several strategic options for routing of the corridors and alternatives for achieving the required transmission capacity were considered at the initial stage of planning. The identification of a number of plausible routes was followed by a more detailed analysis of technical, economic and environmental aspects. The environmental evaluation followed the guidelines of the Holford Rules[5] and aimed to achieve the best fit within the landscape, balancing minimal effects on sensitive landscapes with the requirement of keeping alignments more than 100m from residential buildings.

A public consultation was exercised once an 'optimal' route was identified. Undergrounding of the line was considered at early stages of the project. Although undergrounding the line or sections of it would reduce potential visual or health effects, it will still have a significant environmental impact. SHETL states that a 25m wide corridor of land would be cleared in order to position the power-line. Such a corridor would be needed to remain clear after construction to allow for future access for maintenance and upgrading of the line (SSE, 2012b). National Grid (2009) estimates that, using modern cable technics, undergrounding a typical 400kV double circuit power-line will cost 12 to 17 times as much as installing the same line overhead. This is mainly due to the differences in the cables themselves, the insulation of underground cables and the construction method itself.

3.3 Stakeholders and their objectives

The difficulty in any major infrastructural development is to strike a balance between the long-term objectives of the various stakeholders and the overall benefits of the development. The complex nature of the planning process is largely due to conflicting interests, information asymmetry and the various principal-agent relationships amongst

[4] See appendix 2 for a project timeline.

[5] Guidelines for the construction of new high voltage overhead transmission lines. Includes the notion to avoid major areas of high amenity value, areas of scientific interests, choosing the most direct line and a preference for tree and hill backgrounds rather than sky (National Grid, 2012).

the vast range of stakeholders. Such conflicts occasion transaction costs, further increasing the externalities of projects. This section outlines the participants' differing practical roles in the planning process and discusses the theoretical underpinnings, characteristics and incentives relative to the varied range of stakeholders. The focus is on the process in Scotland, however the theoretical aspects, characteristics and incentives are not country specific.

The Scottish Government

The Scottish Government belongs to the public sector. The public sector is characterised by a multiplicity of dimensions regarding tasks, stakeholders and conflicting interests. A multitude of principal-agent relationships arise from dealings related to both distributive and allocative issues. Governments generally set out to maximise welfare rather than profits and therefore often fail to minimise costs and maximise economic value (Libecap, 1989). In particular, compared to the private sector, incentives for efficiency in the public sector are rather weak due to the absence of competitive situations.

The Scottish government is responsible for setting long-term targets through its Energy Policy. It provides a framework for the authorities and is an important factor in guiding private sector interests. In The Climate Change Act 2009, the Scottish Government set an ambitious target for greenhouse gas emissions at reductions of 42 per cent by 2020 and 80 per cent by 2050. Scotland aims to drive technological development and place itself at the global forefront of providing a sustainable low carbon economy.

The main sources of renewables in Scotland are hydropower and onshore wind farms, however, the Scottish government is implementing support schemes for the development of offshore wind farms, wave power, tidal stream and biomass, of which a growing level is situated in the north of Scotland. An important aspect of the challenge lies in connecting these generation facilities to the transmission network. The construction of the Beauly-Denny HVTL will increase the transmission capacity between the Highlands and central Scotland and was therefore deemed important for a successful Scottish Energy Policy (Scottish Government, 2010). The Beauly-Denny line will enable the construction of an interconnection between Scotland and England – Scotland's port to export green energy.

In Scotland, applications to construct new or modify existing grids are made to the Scottish Ministers. The Energy Consents Unit (ECU) considers all projects relating to electricity generation facilities and overhead power-lines. Both cases for and against an application are considered before giving consent, although particularly sensitive projects are subject to public inquiry. The ECU received the applications from SHETL and SPT to construct the Beauly-Denny line in September 2005. One year later, the unit announced that the proposed upgrade would be subject to a public inquiry. Public consultations, environmental and technical statements, and evidence from nearly 200 witnesses collected during the inquiry were considered when making their recommendation of consent.

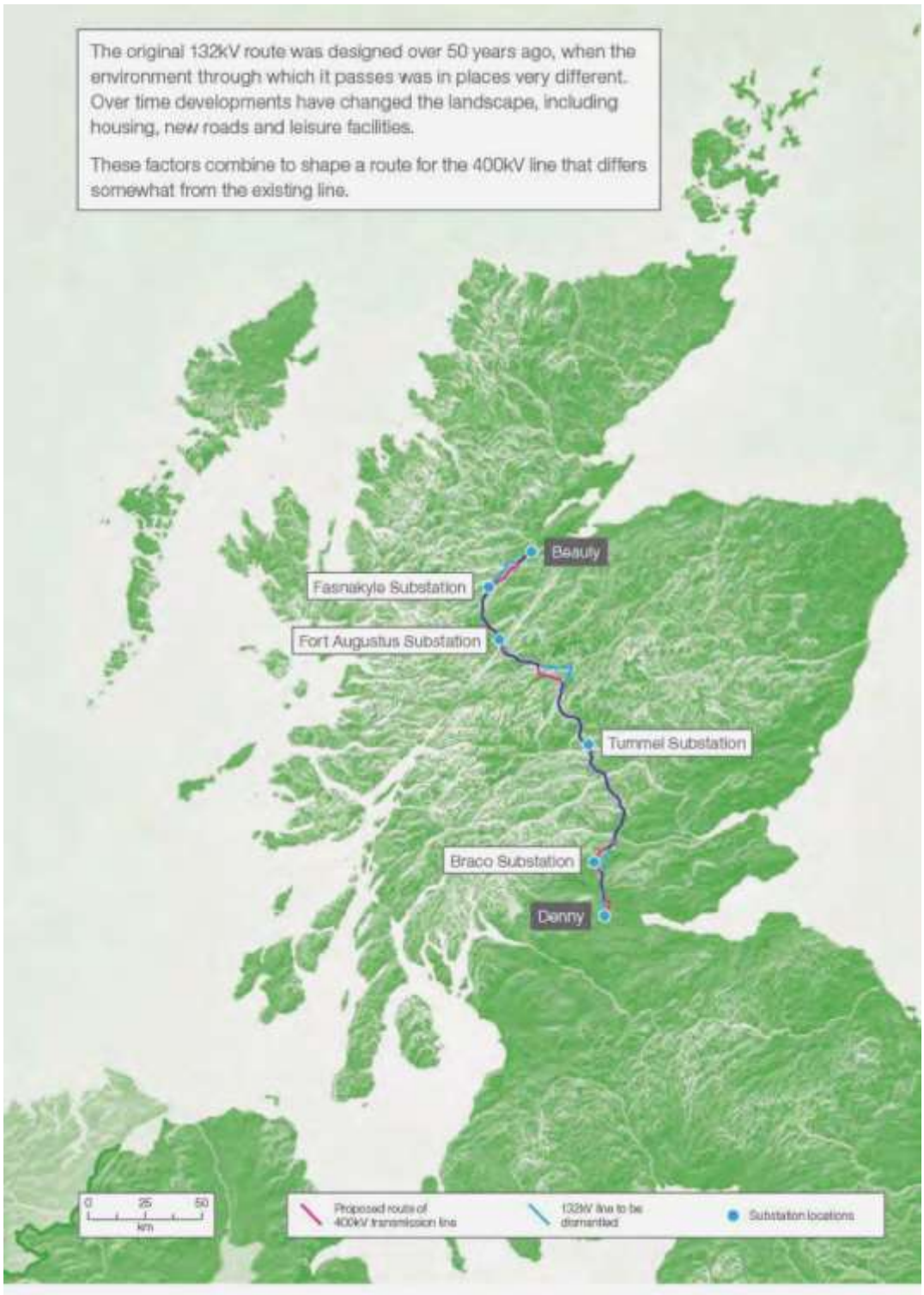
The Sector Regulator

The UK regulator of the gas and electricity markets is the Office of Gas and Electricity Markets (Ofgem). The main priority of the regulator is to protect customers by promoting competition and regulating (natural) monopolies where competition is not an alternative. The focus lies in providing Britain with a secure energy supply and contributing to limit the energy sector's adverse environmental effects Ofgem regulates the TOs through eight-year price control periods, which aim to incentivise innovation, efficiency and curb expenditure. The price controls set the maximum revenue TOs are allowed to generate through transmission levies[6].

Major network updates require significant investment from the TOs who seek approval from Ofgem to raise the capital through increased transmission charges. The TOs are pressured to minimise the expenditure of any project as Ofgem will only approve the costs that are clearly justifiable. However, despite claiming that the interests of the UK consumers are the main priority, Ofgem does not operate within a framework that allows for consumer participation (Littlechild, 2012). Moreover, the formal rules within this framework may not have been created to be socially efficient (North, 1995). North suggests that institutional rules are designed to benefit those with the bargaining power to effect change. In the context of grid development the TOs, relative to communities, are the players with the bargaining power; they are rich in capital and resources and have all the experience in the planning and execution of grid development.

[6] Transmission levies form part of the end-user's energy bill.

Figure 3.1: Overview of the Beauly-Denny power-line routing.



Source: Used with the permission of SSE

Although the Beauly-Denny line is argued to be an important infrastructure development project to maintain competition and enable development of renewable energy it is not officially considered a national necessity for promoting competition and protection of consumers, and is thus outside the price control allowance. However, in 2004, Ofgem put together a mechanism designed to fund transmission projects specific to connecting renewable generation. The Transmission Investment for Renewable Generation mechanism (TIRG) is comprised by four projects, one of them is Beauly-Denny. The mechanism allows for an accelerated process to fund these projects and thus fast-tracking the connection of renewable energy sources to the national grid (Ofgem, 2011).

Scottish Hydro Electric Transmission Ltd (SHETL) and Scottish Power Transmission Ltd (SPT)

Through their transmission licences, the TOs are responsible for providing a secure and reliable service to their customers. Part of this service is identifying, planning and designing new power-lines, which also requires them to produce an environment report to show Ofgem and the ECU that their proposal is justified and that all possible alternatives have been considered.

The incentives for efficiency in the private sector are more powerful relative to the public sector because of external competition. Private companies typically follow the objective of minimising short-term costs and maximising long-term profits. However, the TOs are natural monopolies and despite Ofgem's regulation, following Dixit (2002), it seems realistic to suggest that where there is a lack of competition, little attention is paid to consumer preferences. Therefore on the surface it seems as though the TOs incentives for substantial public engagement are weak.

SHETL maintains that the construction of the Beauly-Denny line is vital to the future of the Scottish transmission network. Further developments, including generation facilities and further transmission lines, depend on a successful and timely construction. As licence holders, SHETL are responsible for ensuring a secure and reliable supply of electricity at reasonable prices and they argue that their license could be in jeopardy if they do not deliver (Personal interview 1, 2012). Although the Beauly-Denny line is mainly covered by SHETL's area of responsibility, SPT realises the importance of the project for future connections, many of which will occur in SPT area (Personal interview 2, 2012). Consequently, Ofgem has granted SHETL and SPT the right to obtain the cost of

the project from their customers through transmission levies. The nature of the industry makes investments in transmission lines relatively safe although there is a certain regulatory risk. These major investments, where the value is in the actual asset rather than its usage, will be at risk if the regulator decides to change the rules of the sector.

Local communities

Community involvement in the planning process is relatively limited. Although invited to comment on draft proposals, communications with local stakeholders are more educational than a two-way information exchange. The communities are characterised by a heterogeneous pattern and also belong to the public sector. They consist of many and diverse individuals and local firms with different preferences that can also change over time. Their targets and objections are therefore difficult to contract and customers may not be willing or able to adequately reflect the interests of present and future customers (Littlechild, 2012).

The general consent among the communities was that not enough effort was directed towards identifying alternative solutions to the routing, such as sub-sea cables or not enough measures to mitigate adverse effects. It should ne noted that community opposition to a grid project may be motivated by the type of proposed technical solution for example in the use of overhead lines instead of underground cables. Community groups, including Stirling before pylons (2010) and Pylon pressure (2010), argued for undergrounding as the only reasonable level to mitigate the impact on wildlife, environment, and limit the visual landscape. However, undergrounding is not the panacea to limit all objections. For example, a section of the Beauly-Denny line crosses over an old battlefield, restricting any construction at the site.

Also, some communities felt unfairly treated as the new developments only inferred costs for them and the benefits are enjoyed somewhere else. They consider the transmission line as substantially reducing the quality of the environment they live in and thus a reduction in quality of life. The long-term objectives of the government to export electricity through a Scotland-England connection intensify the resistance. Further concerns relate to a loss of tourism and therefore a loss of business.

The potential direct benefits of transmission lines for the communities include local job creation and the increased demand of local goods and services throughout the construction phase. However, as the construction of transmission lines is a highly

specific task that requires skilled labour, it is clear that the level of local jobs actually created were limited.

Third party interests

At a general level, there is strong support for green technology but at local levels there has been frequent controversy and opposition in relation to the actual developments. This has become a phenomenon known as NIMBYism ('not in my back yard'). However it is wrong to assume that proximity to the developments is the only factor determining opposition. Often there are objections in relation to developments being too costly; having potentially damaging effects on wildlife and ecosystems; and having a visual burden on the landscape. Such third party objections lead to stalling at the planning stage and reduce the speed of development. For example, non-governmental organisations often develop blanket policies in relation to infrastructural development. Therefore even when they are not directly affected, their experience and resources can provide robust opposition to controversial developments.

A number of NGOs and environmental preservation groups became involved in the Beauly-Denny project. Based on the economic case for the project and the possibilities for green energy, organisations such as "friends of the earth Scotland" and WWF were supportive of the new development. However the support shown by NGOs with interests in preserving wildlife, biodiversity and a scenic landscape objecting to the construction of the new power-line was more substantial. The NGOs challenge the necessity of the project to a greater extent relative to the communities. The John Muir trust argued that the need for the new line was poorly justified and that the strategic case for the chosen route lacked backing. Rather than a new line, they wanted to see an update of current lines, such as the east coast line. The John Muir trust maintains a general renewable energy developments policy, which is in favour of a greater focus on small-scale, sensitively sited renewable energy schemes close to existing settlements (JMT, 2011). Moreover, the Beauly-Denny Landscape Group[7] took part in the public inquiry and produced a parliamentary briefing, arguing against the case. Part of their concern was related to the future effects of the transmission line, such as the upsurge of applications to develop wind farms along its path.

[7] The John Muir trust joined the Association for the Protection of Rural Scotland, Mountaineering Council of Scotland, National Trust for Scotland, Ramblers Association Scotland and the Scottish Wild Land Group to form the Beauly-Denny Landscape group.

3.4 Public engagement in planning of the Beauly-Denny project

Statutory requirements oblige SHETL and SPT to advertise their applications in the local press and planning authorities must be notified: Along the Beauly-Denny line these include Stirling Council, Perth and Kinross Council, the Highland Council and the Cairngorms National Park Authority. Further notifications were sent to Scottish Natural Heritage (SNH) and the Scottish Environment Protection Agency (SEPA). Objections were received from Stirling Council, Perth and Kinross Council, the Highland Council and the Cairngorms National Park Authority and 17250 others. A further 2994 objections were received after the Inquiry closed (Scottish Government, 2011).

Heterogeneous understanding among communities

The communication with the communities at an initial stage of the planning process is a way to introduce the planned extension and increase the communities understanding and knowledge of the project. Public understanding of transmission networks and transmission owners are generally low, as identified by Devine-Wright *et al.* (2010), and as experienced by both SHETL and SPT in the Beauly-Denny project. However, members of the SSE Community Liaison Team[8] noticed a great difference among the communities. The communities that were more familiar with electricity transmission and generation facilities, such as renewable energy host communities, were generally more understanding and sympathetic to the idea of the new power-line. This supports the findings of Soini *et al.* (2011) and Atkinson *et al.* (2006), which suggests that the negative attitudes towards overhead power-lines dissipates over time.

Uneven playing field among stakeholders

Apart from the advertisement in the local press, SHETL and SPT are only required to notify planning authorities of the affected communities in the public consultations. As such, the communities are communicated to rather than consulted. Without a formal forum to make their voices heard, communities organise themselves in local groups, hold community meetings, run blogs, sign petitions and write letters to decision-makers. Communities along the Beauly-Denny line invested a great amount of time and money in their attempt to affect the planning process. During the public inquiry, communities had the opportunity to present their statements.

[8] Following the identification of the need for a close working relationship between the TOs and the communities, SSE implemented the SSE Community Liaison Team in 2009.

However, many community representatives found the process intimidating and extremely stressful. They were under the impression that the inquiry was simply something for show rather than a chance to reach agreement. The Beauly-Denny Landscape Group engaged both engineers and economists to prepare objections against the technical and economic cases; however it was felt that these were not adequately taken into account (Personal interview 3, 2012). The process is thus not allowing for public participation where the public and members of the planning unit can effectively consult and negotiate on a level playing field. This view is shared by a member of the ECU, who reports of the public inquiry as an inefficient practice where the bargaining power is mainly with the project developers (Personal interview 4, 2012). Although local stakeholders are invited to give their views, there is uncertainty regarding how much the government and developers listen. This confirms the findings of North (1994) mentioned earlier that it is the party with the better bargaining power that will benefit most from such institutional rule like a public inquiry.

Financial compensation to achieve increased acceptance

The use of compensation methods in connection with major infrastructure projects are relatively common and are often related to loss revenue and land to those directly affected. These methods can take a number of different forms.[9] In this context, some developers have presented innovative instruments such as offering corporate bonds by the Dutch grid company TenneT in Germany to those affected by the projects (GRID ICT, 2016). Tobiasson and Jamasb (2015) explore the limitations of and the more delicate issues that tend to arise when, as in the case of grid development, compensation is also considered for those indirectly affected.

In the case of the Beauly-Denny project, it could be stated that community acceptance would also come at a price: Given their experience of generation facilities, they often expected some level of financial compensation (Personal interview 1, 2012). The question of compensation was also raised during the public inquiry and on community blogs (Pylon pressure, 2010). The communities pointed towards successful cases of community benefits provided to host communities of wind farms in Denmark and expressed disappointment that compensatory measures were not even considered for Beauly-Denny and transmission lines generally.

[9] See World Bank (2012) and RGI (2015) for a generic overview of the topic and compensation methods in infrastructure projects.

Representatives from SPT argued that there was no revenue margin to absorb increased expenditures from community compensations. Since it is essentially the UK consumers that finance the project, making them pay for something that is not economically viable will not be approved in the Ofgem framework (Personal interview 1, 2012). As part of the consent, SHETL were ordered to pay compensation on two occasions to affected communities. These measures were mandatory and thus Ofgem approved the costs of the compensations to be raised through transmission levies.

3.5 Discussion and policy implications

Public participation in the Beauly-Denny project

The study of the Beauly-Denny project supports the findings of previous studies where the public contribution is at a stage downstream in the decision-making process and thus of little influence (see Littlechild, 2012; Cotton and Devine-Wright, 2010). The communities did not consider the public inquiry as a sufficient forum to argue their case and saw it as just a façade, simply an attempt to calm local opposition. In order for public engagement to be effective, it has to enter the early stages of a project, at a stage upstream the decision-making process. SHETL realised the need for increased community engagement and created the Community Liaison Team. However, not until after the public inquiry had taken place and thus long after the main bulk of oppositions had been received.

Engagement at the later stages of planning provides little scope for the potential to influence the outcome and leaves communities feeling ignored. Meanwhile, if introduced at the early stages, the integration of public engagement can improve the possibility of a successful and excelled implementation of projects (Cotton and Devine-Wright, 2010). Local involvement in the design and implementation of a project increases local understanding and support, and may assist in accelerating planning and development (Herbertson *et al.*, 2009).

Furthermore Arrow (1974) notes that decision making, particularly for issues where no market exists to determine a price, requires collective action. A number of cases are discussed in Littlechild (2012) where negotiated settlements have proven highly successful in the U.S. and Canadian regulated markets; agreements are reached faster more efficiently and at a greater social outcome. An important aspect is the level of trust between communities, government and developers. If communities are taken seriously

and listened to at the start of a project and throughout, the level of trust for developers increases. In turn, this increases the likelihood of successful communications and lowers the rise of conflicts.

The experience from the Beauly-Denny project has changed the way SHETL view and approach new developments. A new transmission line linking Caithness and Moray will feature over 160km underground and subsea cable. For this project the communities and stakeholders were involved from the start and the subsea/ undergrounding solution was identified and favoured over an overhead line.

Specific knowledge as precondition for effective contribution

Allowing communities to take a more active role in the planning process should be done if the benefits, for example, accelerated development, outweigh the costs such as potential financial increases from the negotiation process. Communities along the Beauly-Denny line felt as if their opinions were not taken seriously and felt left out, partly because they simply did not have the relevant information and knowledge about the planning process. It has been recognised that consumers at a general level lack knowledge of the grid, which can limit their contribution in the planning process (Devine-Wright *et al.*, 2010 and Soini *et al.* 2011; Littlechild, 2012).

Knowledge and experience are two important aspects of grid development and planning yet the consumers do not require more know-how than the responsible planning unit. It may therefore be a case for educating, perhaps not the whole communities, but their representatives as a community consultation group. More importantly though is that the future framework and process is transparent and that information is easily available to all stakeholders. The roles and tasks of stakeholders should be clearly stated before commencing new projects, an undertaking which may involve policy changes on a governmental level. This minimises information asymmetries and thus transaction costs.

4. Conclusions

Increased electricity generation from renewable sources is expected to play a key role in achieving climate change policy objectives. However, the current network infrastructure is not well suited for the purpose, requiring both expansion and modernisation to allow a connection of the new facilities to the network. Public opposition to transmission

network developments arise due to conflicts of interests between stakeholders. The lack of information provision, transparency and communication cause uncertainty in local communities, which essentially lead to financial, political and social strains, with some projects ultimately being aborted (see Best Grid, 2015). This is an issue in the UK and across the EU. The conventional decision-making and planning seem to have failed to incorporate the relevant stakeholders effectively, thus generating stakeholder conflicts and ultimately opposition from affected parties, including local communities. Providing a secure and reliable network, including connecting renewable generation sources to the grid, is important to ensure a sustainable green energy future.

This paper has outlined the main issues faced by transmission developments and by applying economic thinking we have identified the potential and shortcomings of the planning process and stakeholder interactions. The case study of the Scottish Beauly-Denny project, conducted through both, first hand interviews and secondary information confirms the findings of the previous studies and showcase a representative modern transmission development. The communities along the transmission line felt ignored, excluded and disappointed of lacking communication from developers and government alike. Communities and involved NGOs' wishes to have been informed of the planned project and consulted at an earlier stage, allowing them more time to process the available information, prepare their own statements and put forward own evidence.

These testimonies illustrate the importance of increased community involvement at an early stage of the planning process. Public contribution is found to be at a stage downstream in the decision-making process and thus of little influence. However, if introduced at the early stages, the integration of public engagement can improve the possibility of a successful and excelled realisation of projects as local involvement in the design and implementation can increase local understanding and support. Moreover, trust between communities, developers and government is important for future negotiations and can be achieved through transparency and set guidelines for stakeholder engagement in the planning process. If communities are taken seriously and listened to at the start of a project and throughout, the level of trust for developers increases. In turn, this increases the likelihood of successful communications and lowers the rise of conflicts.

Furthermore, the paper detected that the planning process of grid developments is highly specific and requires certain knowledge and experience. For communities to understand and effectively contribute, as a consequence, it could be reasonable to specifically educate representatives from the community forming a community consultation group. Transparency in the process is likely to increase trust between stakeholders, which would increase the potential success of future consultations. In policy developments, governments must recognise the link between strong public engagement and public support and allow communities the possibility to influence planning and development.

However, it is yet to be observed and explored how similar projects proceed and whether or not the same problems and difficulties occur. It is to be expected that from a larger number of case studies more general conclusions can be drawn. Moreover, the potential for financial compensation in transmission projects provides the basis for further research. Opposition groups vented their disappointment of the lack of compensation, comparing their situation to communities hosting wind farms, which are regularly compensated through benefit schemes. In principle and theory, the redistribution of costs and benefits to reach a more socially optimal outcome is a viable and seeming solution, yet its application in practice provides numerous obstacles. Further research is therefore required to establish the scope and perhaps the most efficient form of financial compensation, including the separation of assets. This offers a platform for further research into the economic aspects of the issues faced in infrastructural development.

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Appendix 1:

The landscape along the Beauly-Denny route

Beauly to Fort Augustus

This 50km section is predominantly routed in unpopulated moorland and forests. Several rivers and valleys are crossed the current substations at Beauly, Fasnakyle and Fort August will all be redeveloped.

Fort August to Tummel Bridge

This 77km section crosses the Grampian Mountains, areas of remote moorland, coniferous forests and river valleys. The route will follow the A9 a new substation near Tummel Bridge will be constructed.

Tummel Bridge to Braco

This 63km section crosses moorland, rivers, valleys and the low-lying landscape near Crieff and Muthill. A new substation will be constructed near Braco, surrounded by forest and moorland.

Braco to Denny

This 30km section crosses the Allan Water and the A9 before crossing moorland and the Ochil Hills. The route will cross a flat valley of the River Fourth but will avoid the main settlements as this is the most populated section of the route. A new substation will be constructed to the north-east of Denny.

Appendix 2

Timeline of the Beauly-Denny Project

2002/2003:

- Identification of the need for the power-line, planning design

2004:

January and June

- SPT and SHETL publish documents and draft routs for public consultations and initial conversations with landowners.

December

- The community group Stirling Before Pylons is constituted

2005:

July

- SPT and SHETL publish proposed route of the line

September

- SPT and SHETL submitted application to the Scottish Ministers under Section 37 or the Electricity Act 1989, to construct the line in their respective licensed areas.

2006:

April

- Formal process of consolation concluded
- Cairngorms National Park objects the proposed line
- Falkirk Council objects the proposed line
- The Highland Council raises the possibilities of health concerns and asks for further evidence.
- Perth and Kinross council object the proposal
- Stirling Council object the proposal
- SEPA support the application provided that certain matters are satisfactorily addressed.
- SNH supports the application yet requires further information of environmental impacts of certain sections of the route.

August

- Scottish ministers announce that the proposed upgrade will be referred to a public inquiry.

September

- Public Local Inquiry ordered

2007:

February

- The Beauly-Denny Landscape Group is formed opposing the project
- Public Inquiry commenced – Five local discussion sessions

December

- Public Inquiry ended

2010:

January

- Scottish Ministers grants consent to the project
- SPT consult with and meet stakeholders and community to inform the preparation of the Stirling Visual Impact Mitigation Scheme (SVIMS) Consultation Report.

September

- SPT publish the SVIMS Consultation Report and SVIMS Consultation Leaflet

November

- Pre-construction work begins
- SPT undertake voluntary consultation with stakeholders and community on the SVIMS Consultation Report

2011:

February

- SPT submit SVIMS

August

- SPT submit updated SVIMS and Stirling Council given 45 days to comment on SVIMS

December

- Final consents given by Scottish Ministers
- Woodlands and access track constructed

2012:

February

- First tower completed

2015

- Expected delivery of the project